Chimeric globalism

Nading, A. (2015). Chimeric Globalism: Global Health in the Shadow of the Dengue Vaccine. *American Ethnologist*, *42*(2).

Abstract: A laboratory-engineered, “chimeric” dengue fever vaccine entered late-stage clinical trials in the late 2000s. One possible way of interpreting the arrival of a technology like this is to see it as the end point of a unified global project. Alternatively, it can be understood as a “cosmopolitical event.” Instead of reflecting unity, cosmopolitical events magnify social and technical differences, and they afford space to contemplate alternative forms of life. Drawing on fieldwork with dengue researchers in Puerto Rico, Nicaragua, and Cuba, I argue that the chimera appeared at a liminal moment in dengue science. It prompted researchers to contemplate how the divergent logics of pharmaceutical capital, humanitarianism, and biosecurity shaped their work as well as to imagine how that work might otherwise proceed. I conclude by suggesting that attention to cosmopolitical events puts the anthropology of global health into closer conversation with analyses of other global phenomena.

Keywords: global health, biosecurity, science and technology, cosmopolitics, genetic engineering, dengue, Bill and Melinda Gates Foundation

Early in a period of fieldwork at the United States Centers for Disease Control and Prevention (CDC) Dengue Branch in San Juan, Puerto Rico, I found myself struggling to respond to a colleague who asked me why an anthropologist might be interested in studying the science of dengue fever control. My rambling answer began with a litany of facts that she and my other respondents knew well.

Dengue is the most prevalent mosquito-borne virus on earth, but because it has not traditionally been associated with high rates of mortality, research on it has lagged behind research on other viral diseases such as influenza and HIV. Described in classic medical texts as "breakbone fever," dengue can cause body aches, eye pain, extreme fevers, and in its most severe form, internal hemorrhage. Over the past 20 years, dengue epidemics have become more common, particularly in the urban tropics of Latin America and Southeast Asia, where the *Aedes aegypti* mosquito vector is endemic. There are four dengue viral serotypes (DEN 1, 2, 3, and 4), and they are also all now endemic in most parts of the tropics. Dengue mosquitoes and viruses have recently begun appearing in new areas, including relatively affluent subtropical cities like Delhi and Miami.

Thanks to this geographical expansion, dengue research has lately received an infusion of funding and scientific interest. In 2001, pharmaceutical corporations, donors, and public health researchers were brought together in a consortium under a "product development partnership" called the Dengue Vaccine Initiative (DVI). Thanks to work associated with DVI, CDC scientists I met had become increasingly interested in—and optimistic about—the possibility that an effective dengue vaccine would soon be available. The coming dengue vaccine initially appeared to me to be a case of "global health" in action: the end result of a decade of concerted scientific labor and of advocacy from governments, corporations, and philanthropic donors. At the Dengue

Branch, as I told my interviewee, I wanted to know how scientists in what staff referred to as the "five key areas" of dengue research (entomology, epidemiology, clinical medicine, virology, and social science) situated themselves in relation to the coming vaccine.

Listening to this long answer, my interviewee summarized it in more succinct terms.

"You want to know how we *articulate* dengue," she said.

This article centers an anthropological analysis of global health on the question of scientific articulation. Timothy Choy (2011) has identified articulation as a key feature of the process by which so-called global concerns become anchored in specific places and experiences. Terms like *articulation, channeling,* and *friction* call attention to the ways such "matters of concern" as development, justice, health, and climate change can only become "global," ironically, insofar as experts, activists, and citizens manage to root them in specificity and contingency (Broad and Orlove 2007; Ferguson 2006; Latour 2004; Tsing 2005). Even before the rise of the current vogue for "global health," vaccines, as tools of colonial security, as biotechnical commodities exchanged on a market, and as manifestations of a modern biopolitical complex for regulating the vitality of populations, have been key points of articulation (Anderson 2006; Arnold 1993; Foucault 1997). Though they are designed to create a standard immune response in a standardized human subject, vaccines remain notably imperfect as universalizing technologies. The process of vaccination is credited with the near eradication of polio, for example, yet mass vaccination schemes continue to be a source of deep discomfort about the interplay between the universalizing thrust of life science and localized, embodied experience (Fairhead and Leach 2007).

My research on the science of dengue took place not in a context of vaccine delivery but in a context of vaccine development. The articulations to which my CDC respondent referred

were occurring in a moment of palpable possibility. DVI was a uniquely collaborative, multisited research consortium, in which public health researchers were linked to corporate laboratories and funding to create a product that would be both effective and profitable. While the making of a dengue vaccine is certainly part of a process of self-consciously "global" scientific labor, in the context of possibility created by DVI, it became clear to dengue scientists (and to me as an anthropologist of medicine) that global health was constituted of stubbornly disparate—yet still somewhat productive—sociotechnical configurations. What was being "articulated" at the Dengue Branch and elsewhere was not only a set of distinct disciplinary identities, or the relationship between standardized and "local" biologies, but also the tripartite set of priorities—on biosecurity, on humanitarian good, and on capital accumulation—that constitute global health itself (Lock and Nguyen 2010). The dengue vaccine was a potential commodity, a potential "life-saving" injection, and a potential tool for securing bodies against an expanding pandemic.

This article joins a growing set of engagements from anthropology and science and technology studies with the variety of ethical actions, moral communities, and political subjectivities that biomedical technologies engender (Dumit 2004; Hayden 2007; Petryna et al. 2006; Rose 2007; Sunder Rajan 2012). Critical studies of global health have examined the ways high- and low-tech biomedical interventions, from basic nutritional packages to pharmaceuticals, pesticides, and research protocols, hail actors not normally thought of as scientists (i.e., patients, community health workers, volunteers) as subjects of global health (Biehl 2007; Biruk 2012; Brada 2011; Kelly 2011; Nguyen 2010; Petryna 2009; Sunder Rajan 2006). It is in the bodies of these actors that the ideology of global health meets biological reality. In this article, I work along similar lines, but I shift the analytical lens onto scientists themselves and ask, how does the coming of novel technoscientific tools turn scientists into subjects of global health?

I attempt to answer this question by outlining the speculative, spectral, and hybrid aspects of global health. Taken together, these characteristics constitute what I am calling "chimeric globalism." Activities like dengue vaccine development are speculative in that they both offer researchers space for experimentation and open space for corporations to test new products. At the same time, institutions like DVI operate by mobilizing technology and science to confront spectral—that is, not fully formed—biological risks and economic opportunities (Caduff 2013). Health researchers have recently begun classifying dengue as an "emerging" disease that has been closely associated with the rise of "emerging" economies in the global South. Finally, the material structure of the dengue vaccine is hybrid: It is what scientists call a "chimeric" vaccine, composed of a combination of genetic material from dengue and yellow fever viruses. Global health's chimeric nature becomes most apparent in liminal moments, such as those when the social categories that applied to dengue scientists and to the disease itself seemed up for debate.

Drawing on fieldwork that took place amid the anticipation of a chimeric dengue vaccine, I examine how scientists, in Isabelle Stengers's terms, "[turned] the virus … into a cause for thinking" about their position as both makers and subjects of global health (2005a:1002). Using the dengue vaccine as a material and semiotic anchor, I argue for a reconceptualization of global health as the ongoing and never fully complete attempt to reconcile a host of partial perspectives on (among other things) poverty, animal behavior, viral evolution, for-profit medicine, and the technologies that mediate them. As scientific labor (only some of which is directly in the service of pharmaceutical capital) messily and haltingly brings new things into the world, that labor also enables messy, halting reconsiderations of biomedical research as a technical and ethical enterprise. When the dengue vaccine began to seem like a more genuine possibility, researchers attempted to "slow down reasoning" about it. They sought to articulate the relationship between

this possible new tool and the "situation justifying its use" (Stengers 2005b:185). Even though the dengue vaccine was a capital-driven project, the drive to create a pharmaceutical commodity amid the global dengue pandemic neither turned scientists into cynics nor convinced them that, as is so often asserted in the popular media, the for-profit pharmaceutical industry was the only institution powerful enough to produce viable new drugs. Instead, the anticipated arrival of the vaccine constituted what Stengers calls a "cosmopolitical event," which produced "communication between diverging parties without anything in common being discovered or advanced" (2005b:194).

The empirical material in this article comes from six months of fieldwork between 2009 and 2011 in Puerto Rico's CDC Dengue Branch, in a national viral diagnostic laboratory in Managua, Nicaragua, and in international tropical medicine conferences in Cuba and the United States. I observed laboratory work, participated in and observed dengue-related policy and research presentations, and interviewed scientists about their interactions—most of them chimeric, in the sense of being indirect, fleeting, and imaginary—with a "chimeric" vaccine developed by the French pharmaceutical company Sanofi Pasteur and promoted by DVI. After further explanation of the significance of the chimera, both for dengue vaccine science and for an anthropological analysis of global processes, the three principal sections of the article situate the coming of the dengue vaccine at three key transition points.

I first describe how the field shifted during the 1990s and 2000s from a focus on mosquito control to a focus on viral control. Next, I show how public health and government-driven dengue research began an awkward (and, by comparison to research on other diseases, belated) engagement with for-profit pharmaceutical science. Finally, I show how linked concerns about biosecurity and economic security are changing dengue's profile from one of "neglected

tropical disease" to one of "emerging infectious disease." I conclude that attention to cosmopolitical events like the approach of the dengue vaccine provides anthropology with a refined perspective on global health and related phenomena.

[h1]Chimeric globalism

Research on infectious disease prevention and control has long been entangled with geopolitical strategy, capital accumulation, and humanitarianism. Though the CDC is an agency of the civilian U.S. Department of Health and Human Services, one of its precursors was the Office of Malaria Control in War Areas (MCWA). Founded in World War II, the MCWA's roots go back the early 20th century, when the capital-cum-geopolitical project of Panama Canal development engendered novel research on yellow fever and malaria (Sutter 2007). Between the world wars, the Rockefeller Foundation's work to curb yellow fever in Brazil led to further advancement in understandings of that virus and the *Ae. aegypti* mosquito, which transmits it among humans (Lowy 1997). Rockefeller's projects employed scientists who would later be integral to the MCWA, yet its work was also a self-consciously humanitarian countermeasure to the association of the Rockefeller name "with the ills of monopoly capitalism" (Stapleton 2004:208). The work of private health institutions like Rockefeller lay the infrastructural groundwork for the WHO, whose human-rights orientation was driven less by an impulse to redistribute capital than by a strategic deployment of state resources from North to South, with a view to stabilizing a world order.

In the 1990s, this postwar order began to unravel. In the face of the AIDS crisis, the development of vaccines and drugs was spearheaded as much by governments as by the combined advocacy work of nongovernmental patient groups in the North and humanitarian groups working in the South (Nguyen 2010). These efforts used the language of human rights—

integral to the WHO's postwar mission—to convince wary pharmaceutical companies to invest in drug development. The "borderless" nature of the early AIDS crisis, followed by the threats to economic and national security engendered by the anthrax, SARS, and influenza scares, brought humanitarianism, biosecurity, and capital together (Lakoff 2008, 2010). One result of this convergence is the rise of "product development partnerships" like DVI, which link donors, state health services like the CDC, and private pharmaceutical capital (McGoey et al. 2011). A program of the Korea-based International Vaccine Institute (IVI), DVI was initiated in 2001 with seed money from the Rockefeller Foundation, and its work was accelerated in 2003, thanks to a $55 million grant from the Bill and Melinda Gates Foundation.

Dengue presents a special challenge to vaccine makers. Since it comprises four distinct viral serotypes, an individual body can be exposed to dengue up to four times in a lifetime. Any workable vaccine must therefore be "tetravalent." It must confer immunity to all four serotypes at the same time. To meet this challenge, DVI harnessed bench science, in the form of top dengue specialists from leading universities and health ministries like the CDC, to corporate knowhow and research and development, in the form of pharmaceutical industry partners. DVI's goal was to encourage the sharing of data among these players with a view to speeding the road to a viable product. But the product alone was not enough. DVI also had to establish the need for a vaccine through a combination of epidemiological and market modeling. DVI, then, sought to "lay the groundwork for dengue vaccine introduction in endemic areas so that, once licensed, vaccines to prevent dengue will be swiftly adopted by countries most in need," while "creating an enabling environment for vaccine introduction and … maintaining a pipeline of vaccine candidates" (IVI 2014).

The drive to establish a "need" meant suturing the discourses of humanitarianism and biosecurity to that of pharmaceutical capitalism. DVI and similar initiatives began using public relations campaigns and research on the economic burdens and growing threat of dengue to aid companies in jumping clinical and regulatory "hurdles" and to create a workable "supply chain" for whichever vaccine candidate might prove viable (Kaufman et al. 2011). In the span of less than a decade, progress toward a vaccine accelerated dramatically. Along the way, the vaccine became a potential source of blockbuster profits for companies who invested in it.

In 2009, the candidate that was showing the most promise was a tetravalent vaccine developed by the French pharmaceutical firm Sanofi Pasteur and based on a technology known by the trade name ChimeriVax™. ChimeriVax™ names a laboratory invention: a viral "chimera" that contains proteins common to each of the four dengue viruses, spliced onto a yellow fever "backbone" (Edelman 2007).[1] By 2012, ChimeriVax™ had been tested in several sites and deemed viable, but in Phase IIb trials, it stumbled. It showed strong protection against just three of the four dengue serotypes (Halstead 2012). That failure, however, is somewhat epiphenomenal to the argument I make in this article about chimeric globalism.

Situating my argument instead in a context in which a vaccine—any vaccine—seemed possible (as it still does today), I am interested in how approaching technologies hail scientists as subjects of global health. From one point of view, biotechnical commodities are materializations—sometimes living ones—of an uneven set of social relations (Marx 1976; Sunder Rajan 2012). A novel technology like ChimeriVax™ constitutes one end point of a long-term, self-consciously "global" biomedical and capitalist project. It is certainly important to acknowledge that the "philanthrocapitalist" emphasis of the Gates Foundation on technological "grand challenges" and technoscientific fixes, including vaccines, has significantly narrowed the

problem space of international health (Birn 2005; *Economist* 2006). Still, critical analysis must resist the temptation to see such fixes as merely reflective of the hijacking of the life sciences by capital (Sunder Rajan 2012). The figure of the "chimera" brings this idea into sharp relief. The term *chimera* names a concept, an imaginary, and—possibly—a material thing. But because the status of the chimera is conceptually multiple, and because the dengue viral chimera was only ever partially materialized in the lives of most scientists, it was not the simple outcome of a new kind of unified global health science. Rather, it was, in its partiality, a figure that highlighted crucial disjunctures in scientific practice, ethical priorities, and basic understandings of health itself (Barad 2007; Haraway 1997).

Such disjunctures were built into the very structure of Sanofi Pasteur's dengue chimera. The laboratory-ready yellow fever virus that forms its "backbone" emerged from the entangled histories of international health and geopolitics I describe above. The development of a yellow fever vaccine, a priority of military and international health organizations, involved the isolation of the virus in monkeys, its attenuation in chicken embryos, a competition between the U.S. Rockefeller Foundation and the French Pasteur Institute, and the unintentional contamination of a vaccine with potentially cancer-causing avian leukosis virus (Frierson 2010). The stability of the dengue chimera's backbone, then, rests on a decades-long series of halting engagements between capital, science, military security, and humanitarianism.

Chimeras are probably most commonly conceived as fantastic or mythical entities. In classical mythology, the Chimera was the three-headed monster—part lion, part goat, part snake—slain by Bellerophon. Sanofi Pasteur's ChimeriVax™ rests on the border between reality and corporate fantasy. It is also a "monster" in the sociological sense: a "heterogeneous and outrageous collage" with a particular political-economic history and a multivocal symbolic

power (Law 1991:18–19; see Haraway 1991). The specifics of its genesis are shrouded behind intellectual property law, and though it was promised as a solution to the global dengue pandemic, that promise has yet to be realized. Still, for the scientists with whom I worked, the coming of the dengue chimera did not create a wholly new ethical or technical landscape. Instead, it caused scientists to contemplate the manifold political, economic, and epistemological arrangements their work helped shape and that, in turn, shaped their work.

Going a step further, I also conceive of the global health envisioned by DVI as chimeric. Global health is constituted of at least three distinct "global assemblages," in which power is distributed in heterogeneous and sometimes contradictory ways (Collier and Ong 2005). DVI sutures what Andrew Lakoff (2010) has identified as two dominant social and institutional drivers of global health, humanitarianism and biosecurity, to a third, pharmaceutical capitalism. DVI's view is that humanitarian needs can be filled by creating capital opportunities. The logic of the product development partnership also hinges on the proposition that bodies in the global North and the global South can be secured against a shared threat. The vaccine is a global (i.e., universal) solution to a global (i.e., geographically comprehensive) threat, enacted through the global (i.e., spatially extensive) reach of capital.

Political theorist Jane Bennett conceives of the assemblage as a "space of events," which is productive of material outcomes, with no single element sufficiently "competent to determine consistently the trajectory or impact of the group" (2010:24). The chimeric virus, the ongoing and incomplete result of (and context for) a diffuse process of scientific labor, constitutes such an event-space. Many dengue researchers saw their work as taking place either in the service of or in dialogue with Sanofi Pasteur's project, but since the company owned ChimeriVax™ exclusively, most of those same scientists never "saw" it. In conferences and presentations at the

CDC, at a regional dengue symposium in Havana, Cuba, and at the American Society for Tropical Medicine and Hygiene meetings, Sanofi Pasteur explained key elements of the technology, but much information about it remained secret. This semitransparency was a central feature of the institutional arrangement of DVI, which, as a scientific advocacy organization, made no overt endorsement of any particular product. This meant that, for scientists, relationships to the vaccine were always partial.

Nevertheless, during my fieldwork with dengue researchers, ChimeriVax™ was a frequent topic of discussion. Press releases from Sanofi Pasteur and from DVI, along with a surge of research designed to lay the groundwork for large-scale trials, made the promise of a viable vaccine seem more and more assured. Yet, for most of those involved with dengue from either a public health or an academic perspective, the figure of the chimera remained—to deploy one common meaning of the term—"speculative," in the sense that it was an unrealized capital investment, an erstwhile viral enemy turned into a possible ally (Beisel and Boëte 2013; Lowe 2010). Like Scrooge's three spirits, the chimera did less to directly alter the future of dengue research than to cause scientists—even in moments that seemed to signal acceleration toward a new era—to "slow down" their reasoning about what they were doing (Stengers 2005a). As Carrie Friese (2013:S134) notes in a study of how laboratorians "care" for experimental animals, concern is not necessarily something new or unknown in life science but something subconsciously known all along. In other words, the coming of ChimeriVax™ caused researchers dedicated to understanding the four already-existing serotypes of the dengue virus to reconsider their relationship to them and to one another (Stengers 2005b).

The global chimera is thus not just a theoretical notion, a biotechnical construct, or a newborn being. What I am calling "chimeric globalism" is, instead, an ongoing "practice of

knowing" distinguished by "*material engagements that participate in (re)configuring the world*" (Barad 2007:91). By engaging obliquely with the chimera, dengue scientists attempted, in Karen Barad's terms, to "be accountable to the specific materializations of which [they were] a part" (2007:91). In the rest of this article, I use ChimeriVax™—a material hybrid of "natural science"—as a model for a "social scientific" or "humanistic" interpretation of global health. At the same time, I want to understand the figurative chimera—a humanistic and anthropological term for a speculation or specter—as a model for natural scientific practice. I thus follow Barad in aiming to "place the understandings that are generated from different (inter)disciplinary practices in conversation with one another" (2007:92–93). To put the "monster" in classic anthropological terms, the viral chimera appeared (or seemed to appear) at a liminal moment, when the disease itself was betwixt and between social identities. Like the kinds of "monstrous" images or masks that appear to ritual supplicants or in moments of social transformation, the chimera startled research specialists "into thinking about objects, persons, [and] relationships … they [had] hitherto taken for granted" (Turner 1964:105). I discuss chimeric globalism as a liminal phenomenon in three ways. First, the chimera appeared as scientists grappled with two ways to frame dengue, as a mosquito-centric problem and as a viral-centric problem. Second, the chimera appeared as public health researchers attempted to reconcile scientific rationality with market rationality. Third, the chimera appeared as experts and advocates discussed whether to frame dengue as a "neglected" disease or as an "emerging" one.

[h1]Viralizing dengue: From mosquitoes to molecules

From the 1980s to the early 2000s, community-based projects designed to rid urban households of mosquitoes were the mainstay of dengue prevention. In 1989, Dr. Duane Gubler (1989:575), then the chief of the CDC Dengue Branch, addressed the American Society for

Tropical Medicine and Hygiene, telling his audience that if *Ae. aegypti* mosquitoes were to be controlled, and if, by extension, dengue were to be controlled, people in endemic communities should be active participants in insect management. Given that *Ae. aegypti* breeds primarily in and around human houses, argued Gubler, "responsibility" for control of the domestic mosquito rested with individuals. The notion that mosquito "source reduction" is the main way to stop dengue and other mosquito-borne illnesses is, of course, an old one, dating back to the earliest days of public health intervention, but Gubler's 1989 speech marked a moment in which scientists and policymakers doubled down on that idea (Carter 2012). The speech affirmed that the shared mosquito–human environment was the proper space of intervention.

This approach amounted to a household-level "mosquitoization" of the dengue problem. The emphasis here was not just on the regulation of human bodies in space but on the bodies of humans and mosquitoes in a space they shared. From the late 1980s to the 1990s, at least a dozen major community-based mosquito reduction programs sprang up, from Puerto Rico to Honduras to Mexico to Vietnam. By 1996, Gubler was publishing his own assessments, and they were mixed. The programs had not yielded significant reductions in dengue incidence over time. The problem, as Gubler and others saw it, was that mosquito control tended to diminish in effectiveness after funding ended and experts left target communities (Gubler and Clark 1996). Dengue continued to be "neglected"—it appeared—by people in affected areas. As some anthropologists pointed out, however, by giving dengue such a local valence, the source-reduction approach was neglecting another factor: the political-economic origins of the problem (Kendall 1998; Whiteford 1997). Infrastructure in dengue-endemic cities was inadequate. Built environments were full of places for mosquitoes to breed (water storage containers, broken pipes, piles of refuse). Even though infrastructure was spotty, marginalized urban communities

were connected through routes of trade and travel that carried not just people and things but also mosquitoes and viruses.

Still, by the turn of the new century, many experts were declaring mosquito control to be insufficient (and inefficient) for managing dengue. Controlling *Ae. aegypti* required mobilizing public health services and community volunteers while harnessing the will of householders. In Puerto Rico, as CDC Dengue Branch entomologists told me in 2009, *Ae. aegypti* was not only more abundant than ever but it was also appearing in unexpected places such as old septic tanks (Barrera et al. 2008). The mosquito's resilience was exceeded only by that of the virus. Dengue was starting to emerge in new places and in new bodies as well, particularly those of travelers and military personnel. Founded in 2001, DVI proposed that the response to this spread was to change the emphasis of research and preventive practice. A global disease, it seemed, warranted a global solution: a vaccine.

By the start of my research in 2009, advances in viral genetics and molecular engineering technologies had made confronting the dengue virus, rather than the mosquito, seem more promising than ever to scientists and policy makers.[2] I arrived at the Dengue Branch just over three years after the start of an "Enhanced Surveillance" project that was in operation in the region of Patillas on the south of the island. Enhanced Surveillance was the name scientists gave to the idea that epidemiologists could identify a high number of dengue cases by using technologies such as viral neutralization tests, immunoglobulin assays, and polymerase chain reaction (PCR) assays. Instead of waiting passively for clinics to submit blood samples from patients they suspected of being infected, the CDC actively looked for dengue cases in Patillas's health center by working with doctors and other personnel to closely monitor signs and symptoms (Ramos et al. 2008). The Patillas project made viral surveillance central to

epidemiological surveillance. The idea was that by actively looking for viruses in bodies, rather than for mosquitoes in households (and by actively rather than passively collecting blood serum), scientists could understand disease dynamics with greater clarity. Along with the CDC's directorate of vector-borne diseases, DVI and Sanofi Pasteur were two of the initial driving forces behind the project (Ramos et al. 2008:123).

To put ChimeriVax™ into advanced human trials, Sanofi Pasteur needed to find places that had both reliably high rates of dengue and a system in place to monitor the behavior of the pathogen in the population. Patillas was such a place. As the CDC's Enhanced Surveillance project developed, entomologists from the Dengue Branch tried to integrate mosquito research into it, but Sanofi denied them resources and funding.

"That was counterintuitive," one Dengue Branch scientist (not herself an entomologist) told me, "but if you had [active] mosquito control, you couldn't prove epidemiologically that it was [our] surveillance and not the entomology that was cutting the numbers of cases."

As an entomologist told me amid this debate, this decision was misguided, because insect control was inherently more social than viral surveillance: "I would kill more mosquitoes with a social facilitator than with an exterminator." Publics had to fully engage with mosquito control for it to have meaning, but such engagement was difficult to quantify or track.

In other words, if mosquito control measures worked, Sanofi Pasteur could not develop an epidemiological baseline for vaccine trials. Thanks in large part to DVI, advances in diagnostic and genetic technology over the previous decade had made a "molecular" epidemiology possible. Virologists could survey the movements of various dengue strains as they drifted from country to country using rapid open-source genetic sequencing of viral isolates.

In an age of global connection, making mosquito control the leading edge of dengue science no longer seemed like the right thing to do.

To lay the groundwork for a vaccine, DVI had to help reorganize and reconceptualize dengue's geography. Specifically, the space of dengue prevention had to move from the built environments of urban poverty to the bodies of dengue victims (rich or poor); from insect habitats to cells; from national and supranational policy to the quasi-public, quasi-governmental product development partnership. Patillas was prototypical of this new territoriality. Dengue science, long centered on mosquitoes, had been viralized.

One consequence of viralization was that environmental dynamics and economic barriers to prevention could be discursively and materially partitioned from bodily concerns. Throughout my 2009 CDC fieldwork, scientists repeatedly referenced a 2004 study of dengue seroprevalence in Brownsville, Texas, and Matamoros, Mexico. That study found that the prevalence of dengue antibodies in individuals on the Mexico side of the border was higher not because there were more mosquitoes in the area but because Mexican respondents were less able to protect themselves from mosquitoes through the installation of screens and air conditioning units. Between Matamoros and Brownsville, median family income was the only significant statistical predictor of recent dengue seroprevalence (Brunkard et al. 2007). After hearing this study referenced repeatedly in interviews, I suggested to one researcher, an epidemiologist, that such findings might justify more attention to the political-economic origins of dengue outbreaks. He was sympathetic, but he told me bluntly, "You can't cure poverty."

The importance of the context of that suggestion—that scientists cannot cure poverty—cannot be understated. As the entomologist's musings on "social facilitators" show, mosquito control has long been connected to a form of community-based public health—one that dates

back to the progressive Alma Ata declaration of the 1970s (Nading 2014a). Gubler's calls for "community responsibility" certainly marked a move away from that developmentalist vision, but when Sanofi Pasteur began presenting a viable vaccine alternative to mosquito control, an unapologetic suggestion that poverty and dengue science must be separate became plausible. The prospect of a chimeric vaccine allowed those who saw it as a promising way forward to rearticulate their relationships to entomologists, who continued to argue that their work "socialized" the dengue problem in ways that molecular epidemiology could not.

As Ed Cohen notes, "Anything that rends the proper human scale—especially insofar as 'the human' appears to take place properly within the scalar narrative we call 'the body'—can assume the viral form" (2011:26). Viral surveillance is both more explicitly about risk to the "standardizable body" in the abstract (and singular) and less explicitly about the precarious, entangled lives of historically particular bodies (multiple) in the environment (Lock and Nguyen 2010; Rose 2007). Dengue has long been listed among the world's "neglected" diseases, associated with places excluded from the world economy. As the four viral serotypes have begun circulating with more intensity, dengue has come to be labeled an "emerging" disease, associated with the "emerging" economies of Asia and Latin America, where the disease is most prevalent. In other words, as economic growth has been revisioned as a unifying force, the disease has been revisioned as a problem of standardizable bodies. Under conditions of neoliberalism, economic "emergence" has come along with a rollback in state funding for community-oriented public health institutions, including those that traditionally carried out mosquito control (Nading 2014a). The shift from a disease geography based on human–insect relations to one based on human–viral interactions underscored a deeper tension between public health and bench science.

Notably, the thing that was supposedly driving this shift (ChimeriVax™) was little more than a fleeting presence in the conversations scientists had about it.

[h1]Commodifying research: Between profit and play

The search for a dengue vaccine is nothing new. The United States and other militaries have, for example, been interested in a vaccine since World War II (Kitchener 2010). Dengue ravaged troops in the Pacific Theater during that war and, later, in the Vietnam and Gulf Wars. Increasingly, however, that military concern has been joined with economic ones. Dengue is now most prevalent in so-called emerging economic zones, including in Southeast Asia and Latin America. Though mortality from dengue fever is low (less than 5 percent by most estimates), DVI has attempted to demonstrate its costs in terms of quality- and disability-adjusted life years (Carrasco et al. 2011). The rush to create a vaccine for "emerging markets" in Asia and Latin America has intensified as it has become clear that governments and individuals in these areas might be willing and able to pay for them. By the late 2000s, cost feasibility and technical feasibility seemed to be meeting.

[h2]*Rational and irrational vaccines*

Still, a dengue vaccine remains elusive. Tony, a biologist at the CDC dengue branch, reflected on this.

> [diag]Tony: There's still a lot of … research that has to be done to be able to figure out what's going on.
>
> AU: So do you see this as the direction that research is going in?
>
> T: I don't think so, actually. I don't think [most researchers are] really looking into a lot of this stuff. From what you hear a lot now they're … focused on the vaccines. So they're trying to look at other ways to make them a little bit cheaper and more competitive, but it

> seems that most of the people are sort of looking into that. And that again comes into … who's putting in the money for what? So their focus is trying to get vaccines out, but a lot of the times if you do some research into the vaccine studies or the vaccines that are being developed, I'm not sure that they really know what they're doing. They've attenuated the viruses, but they don't know why. Why is it attenuated? Is it that it's not binding some sort of viral gene within the host? What exactly is it doing that's causing it to be attenuated? And obviously you're looking for attenuation to make a vaccine, but ... there's not a lot of logic behind it. A lot of people may criticize what I say, but ... there's rational vaccines and irrational vaccines.
>
> [end diag]

Tony was critical of what he considered to be a glut of dengue vaccine candidates in research and clinical pipelines. Like other dengue specialists, he recognized that the level of attention to dengue from funders and the broader scientific community had traditionally been low, particularly compared to diseases such as HIV and influenza. This allowed flawed vaccine candidates, including versions produced by the United States military, to reach remarkably late stages of clinical trials. This also meant that dengue was—despite its extensive epidemiological profile and intense interest from militaries—long considered an "orphan disease" within the civilian virological community. The Dengue Branch staff of permanent researchers and postdoctoral fellows, funded both by the CDC and by other entities such as the Oak Ridge Institute, included a number of scientists trained in laboratories dedicated to influenza, HIV, or other viruses, who had then shifted to dengue in search of novel opportunities. As one microbiologist told me, the relative openness of the dengue field had long permitted a considerable amount of "substandard" science to be published. When it began in 2001, DVI, in

concert with the WHO and the Pan American Health Organization, promoted collaborative, open-source research on viral genetics and human immune response. This created opportunities for virologists wary of joining a crowded field of HIV and influenza specialists. For Tony and others, such collaboration was the right way to create a vaccine: the "rational" way. Pharmaceutical capital, combined with alarming statistics about the spread of dengue into emerging economies, was thus contributing to two seemingly opposite trends. On the one hand was what Tony and others saw as the "irrational" rush to develop a vaccine, which was bringing more and more suspect candidates into trials that were almost certainly doomed to fail, and, on the other hand, was a welcome raising of dengue's profile, which was leading to high-quality basic research on viral–immune system interactions.

The reliability and standardization of laboratory-based work and the felicitous convergence of scientific advancement with economic development in dengue-endemic regions played foil to the unpredictability of tracking uncooperative people and elusive mosquitoes. In addition, the number of "outsiders" (i.e., laypeople) who needed to be assembled in premarket viral research was much smaller than the number required for massive mosquito research. Vaccine research required people's blood but not their participation. Virologists I interviewed recalled a time in the not-too-distant past when virology and immunology were somewhat ignored in favor of mosquito control projects, and they welcomed the chance to be on the leading edge. Projects like the one in Patillas gave bench scientists a higher profile, and it allowed them to test and use new genetic methods, including PCR and advanced immunoglobulin assays.

At the same time, it increased their workload. The efficacy of any vaccine would have to be tested with standardized diagnostic and surveillance methods. What had happened in Patillas would have to happen worldwide. Before and during the Patillas project, CDC staff were

routinely dispatched to other countries to train technicians on how to carry out advanced viral diagnostic procedures. Yet those procedures were not foolproof. Dengue remained, as one virologist put it, “a pain in the butt.” It was hard to grow in the lab, diagnostic tests often failed to account for its presence, it performed poorly in animal models (except genetically engineered, chimeric murine ones), and it was sensitive to impurities. The real shame, she told me, was that discoveries about the virus in the lab happened through what scientists called “play,” a shorthand for basic bench research. As the Patillas project wore on, then, CDC scientists began to recognize its disadvantages. What I described above as “viralization” raised their profile relative to that of entomologists, but it also forced them to recognize the industrial quality of diagnostic work. At the height of the Patillas project, talk of laboratory “throughput” was much more common than talk of novel discovery. CDC staff acknowledged that, as workers in a public health institution, they could not do experiments in the way that university scientists might, but they also thought that their public health mission gave them greater insight into what kinds of “play” would really be of public health value. In a way, then, viralization was turning them not into better scientists but into what one respondent described as better “middle managers.” At the CDC, this was not a new condition. Public health laboratories have always been semi-industrial. The “mission” of the Dengue Branch was partly to develop new understandings of viral–immune system interactions, but it was also partly to apply existing understandings to produce data.

But the chimera revealed deeper rifts between scientific rationalization and market rationale. DVI was founded, and later supported by the likes of the Gates Foundation, to ensure that any product that was developed would go first to those who were normally neglected by pharmaceutical research and development. This prioritizing appealed to both academic and government dengue researchers, many of whom self-consciously identified as public health

scientists and conscientiously avoided working for pharmaceutical corporations.

Although a Sanofi Pasteur representative who addressed the staff of the CDC Dengue Branch in 2009 claimed that the vaccine would be "for the common man," the company's for-profit motive in Patillas was no secret. As the CDC virologist who complained of "throughput" demands told me, "I thought that [getting involved with Sanofi Pasteur] was the wrong decision. It diverted us from our mission."

"For-profit companies," she went on, "are driven by profit and not by humanitarian ends." She openly imagined an alternative scenario in which the entomologists had not been cut out of the Patillas project. She used the coming of ChimeriVax™ to think about how dengue research "might have been otherwise" (Star 1991:53). She pondered how, absent the outsized influence of capital, dengue research could be a truly emergent enterprise, in which "play" was central. This scientist was one of several at the CDC who described her work as shaped by a "mission mindset": a commitment to public service. Virologists and entomologists shared building and laboratory space with one another, frequently collaborating on projects. Their research was both about Puerto Rico and performed as "mission" for the United States and its "Associated Free States." A productive tension among disciplines, and between laboratory and environment, structured their research in ways that would have been difficult for Sanofi Pasteur to perceive (Kohler 2002). Indeed, after Sanofi Pasteur's involvement in the Patillas project ended, the enhanced surveillance activities continued, and the entomologists were invited back in.

[h2]*Thinking otherwise*

The concerns scientists like Tony raised about the rationality of the research process, which were inflected by concerns about the rationality of Sanofi Pasteur's marketing plan, did

not, however, prompt them to opt out. In her work on theoretical physics, Stengers (2010:9) addresses the dilemma facing scientists who witness the "parasitic" penetration of capitalism into the spaces of research. While she (2010:9–10) advocates resistance to such parasitism, she argues that it should not be based on a "vindictive morality" that imagines a future free of ethical compromise. Instead, she favors an approach that takes seriously the ethical and technical reasoning of the "living physicist": one that "celebrates" (in the sense of highlighting and calling analytic attention to) her "anxiety." Anxiety, Stengers (2010:12–13) argues, is part of a "speculative" process—of imagining how worlds might be otherwise. Sitting in the shadow of the vaccine, dengue scientists were anxious, but they were not prepared—ethically or professionally—to reject the world they had helped create.

Around the time of the Patillas project, Sanofi Pasteur and DVI were supporting advanced molecular epidemiology in another, rather more "out of the way" place: Managua, Nicaragua. In 2004, the nonprofit Sustainable Sciences Institute (SSI), University of California, Berkeley, scientists, and Nicaraguan Ministry of Health personnel began a long-term cohort study of dengue in children there. By the time I first visited in 2009, the laboratories of the Nicaraguan National Diagnostic and Reference Center (CNDR) were outfitted in much the same way as the CDC's Puerto Rico facility. In many ways, CNDR looked like what Hannah Appel (2012) describes in her analysis of the geography of oil extraction technology in West Africa: a site of "modular" biocapitalist infrastructure. There were PCR robots, climate-controlled workstations, functioning fume hoods, advanced computers, mechanized pipettes—everything a state-of-the-art virology lab needed. For Nicaragua, this was quite extraordinary, and in contrast to the ethos at CDC, a belief in the importance of humanitarian biomedicine was crucial to making CNDR into the facility I observed. The goal of SSI, the Nicaragua project's principal

nongovernmental supporter, was to democratize biomedical technologies: to take viral research out of the exclusive hands of experts in the North and to train scientists in endemic countries (still nearly all in the global South) to do work that was up to worldwide standards (Harris 2004). Rather than capitalist modularity, SSI and the Nicaraguan Ministry of Health were attempting a kind of humanitarian modularity (Redfield 2013). The partnership took advantage of what might be called a "mission mindset" among Ministry of Health leaders, many of whom were trained during Nicaragua's revolutionary period, when health care was a central feature of state socialism. They came to professional maturity at a time when technical cooperation from the North arrived through acts of international solidarity—and opposition to U.S. political hegemony (Nading 2014a). Even in the 1980s, the Nicaraguan Revolution was never dogmatically anticapitalist. Given the opportunity, SSI and the Health Ministry eagerly partnered with DVI, fully aware of the consortium's connections to for-profit companies.

DVI funding for the Nicaraguan cohort study ended in 2009. SSI and its Nicaraguan Health Ministry partners were offered a chance to renew the partnership, on one condition. Nicaraguan officials were told, according to one CNDR leader, "If you want to renew your contract with DVI, you have to work with Sanofi." They would have to run a clinical trial of ChimeriVax™. SSI's cohort study provided an even better baseline for trials than the CDC's project in Patillas. Yet Nicaraguan Health Ministry officials refused to run the trial. They turned down the funding.

Their reasons, according to CNDR officials I interviewed, were threefold. First, they were not comfortable with the idea that their work would no longer be publicly accessible. Data from a trial of ChimeriVax™ would not be published in the normal venues; rather, it would belong to the company. As scientists, they could not abide this kind of partnership, even though

they had been happy to get what they could out of DVI and its corporate and philanthropic backers in the form of equipment and tools, and they were justifiably proud of their publications and grantsmanship. “When you’re in a clinical trial,” a CNDR official told me, “you do what the company says.”

The second reason for the Nicaraguan refusal was less about intellectual property and more about the ethos of work. CNDR’s lead scientist told me that a key reason he and his team wanted to turn the company down was that they felt that they were capable of more than simply administering a clinical trial. Vaccine studies, as he told me, divert resources from other kinds of epidemiological research. “We’re not interested in only doing vaccine studies,” he explained. Experimental molecular epidemiology, tracking viral serotypes through a population, and comparing their behavior across regions and timescales was much more interesting and more rewarding. The “modular” tools at CNDR were certainly designed and installed with the expectation that they might serve a vaccine trial, but they could be put to other uses. CNDR staff were pursuing an NIH-funded influenza study, which permitted them to try new experiments and to continue the dengue cohort study.

Finally, CNDR’s staff were uneasy about the rush to put ChimeriVax™ into advanced trials. “We’re still not sure about this vaccine,” the CNDR official confessed, “and the idea of testing it on the children here [in Nicaragua] scares us.” As scientists who had participated in the viralization of dengue, the Nicaraguan project leaders found good reason to favor precaution. “[Sanofi] has done several trials, with lots of results, but we still don’t know what happens when a vaccinated population encounters the virus—the wild virus,” the official told me. The pediatric cohort with whom they worked had been exposed in 2009 to both dengue and influenza A-H1N1 (the “swine flu”), and preliminary evidence from SSI’s NIH-funded study indicated a possibility

that these viruses were coinfecting children, with severe illness and even death as a result (Perez et al. 2010). In the Nicaraguan Health Ministry's pushback to Sanofi Pasteur's attempt to penetrate their projects, then, scientists drew on both the trope of the mutually beneficial global health "partnership," borne out of humanitarian concerns, and that of the "threat," born out of biosecurity concerns (Crane 2013; Lakoff 2008). The chimeric vaccine, once a package that bore the promise of scientific democratization in Nicaragua, was now a different kind of monster: the potential seed of a new syndemic.

[h1]Securing life: Between neglect and emergence

The kind of "what if" thinking that prompted the Nicaraguan refusal remained at the core of resistance in the scientific community to the rollout of ChimeriVax™. The viralization of dengue, while certainly an attempt at epidemiological control at the molecular level, offered what Michelle Murphy, paraphrasing geographer Bruce Braun, calls "a vision of a world chaotically and dangerously interconnected by unpredictable viral exchanges" (2008:697). At a 2011 meeting of dengue experts in Havana, Cuba, Sanofi Pasteur officials made a series of presentations in which they repeatedly invoked the "failure" of the mosquito-oriented approach to dengue control. Against this, they mounted evidence of ChimeriVax™'s efficacy and safety as shown in completed Phase I, Phase II, and ongoing Phase IIb clinical trials. Finally, they previewed game plans, based on sophisticated epidemiological models, for implementing population-wide inoculation. The audience at this meeting included not only the Sanofi Pasteur researchers' scientific colleagues but also midlevel health ministry representatives from around Latin America. The presentations were "proof of concept" and "proof of execution" as well as active market making. One speaker's PowerPoint slides included a bright artist's rendering of the factory outside Lyon, France, that would be able to produce 100 million doses of ChimeriVax™

as soon as regulatory approval came. In line with DVI rhetoric, the Sanofi Pasteur presenters promised that this vaccine's distribution would be different. Priority would go to needy countries, and work with WHO on getting reduced-cost plans for rollout was underway at that very meeting.

After the series of presentations, a European epidemiologist rose to ask a question: "What if, five, ten years after release, your vaccine does not turn out to have long-term effectiveness or safety?" he asked, "Is there really room in the vaccine partnership for competition after your vaccine has been launched?"

"Of course," the Sanofi Pasteur official answered. The market was expansive, and the need was great. If another project showed equal promise, surely DVI would advocate vigorously for its rollout.

In a brief interview with me just after this series of presentations, the same Sanofi Pasteur official was unabashed about the market potential of ChimeriVax™. By being first to regulatory approval, the company stood to make a killing. The dengue vaccine market was worth much more even than the market for influenza vaccines. Yet the potential profit, as Sanofi Pasteur's CEO, Chris Viehbacher, told Reuters in 2009, lay in the fact that dengue had been relatively neglected by other big players in the pharmaceutical game: "You're talking about over 230 million people affected by dengue … The volume is there and it's just going to be a question of how you price it in different markets … I would suspect *the dengue vaccine is not on anybody's radar screen* … It certainly has the blockbuster potential" (Berkrot and Krauskopf 2009, emphasis added). The Sanofi official echoed this, adding the detail that the dengue vaccine constituted a billion-plus-dollar market.

I repeated the epidemiologist's question. "But aren't you worried about not having the best product?"

"We're much farther along," the official reminded me, "Plus, we have a factory!" He pointed to his PowerPoint slide. Sanofi Pasteur had its own supply chain, and, as attendees at the Havana meeting learned, the WHO was taking tiered pricing and subsidies seriously. Though the Sanofi Pasteur official did not say this, it was clear that it was up to DVI, not the company, to guarantee that no head of the global health chimera—neither humanitarian medicine nor biosecurity nor biotechnical capital—would devour the others.

The vision of DVI was that a humanitarian need for attention to a neglected threat could be filled by creating a capital opportunity where there was thought to be none previously. (Vaccines are a pittance in the global pharmaceutical market. "Developing country" vaccines account for 50 percent of sales volume but only about 5 percent of the revenues [Levine et al. 2005:14].) The vaccine was a potential tool for stopping a pandemic. But the biothreat, like the vaccine, was also a chimera: a monster that might turn out to be a mirage. DVI and Sanofi Pasteur had to walk a fine line. While dengue had long been "neglected" in terms of research dollars and public attention, they had to depict it as "emerging," as both a pathogen and the harbinger of a new niche for capital. The manufacture of markets required the manufacture of bio-insecurity. Through DVI, dengue, long spatially limited by the term *neglected tropical disease*, was being spatially reimagined—and literally reengineered—as an emerging global disease.

In practice, however, given the advanced state and continued success of the ChimeriVax™ trials, DVI had by 2011 largely abandoned active promotion of Sanofi Pasteur's product, giving more attention to ChimeriVax™'s closest competitor, a chimeric tetravalent

vaccine developed, ironically, by the CDC, and leased to Inviragen, a much smaller biotech startup. Sanofi Pasteur had outgrown DVI, thanks in part to its Phase I and Phase II trial successes, which were lauded in the financial and scientific press. DVI's diversification looked prescient in 2012, however, as Phase IIb trials revealed that ChimeriVax™ provided robust protection against just three of the four dengue serotypes (Halstead 2012). The blockbuster drug was now in jeopardy. Sanofi Pasteur had invested heavily in ChimeriVax™, but it turned out to be a chimera in more than one sense.

Paradoxically, as one vaccine scientist told me, DVI now finds itself once again vigorously promoting community-level mosquito control, to keep states and citizens affected by dengue attuned to the threat posed by the disease. In a 2013 interview posted on DVI's website, Gubler, who had led the charge for a revised mosquito-centric approach back in 1989, was promoting a new advocacy arrangement, the Partnership for Dengue Control (PDC). His narration of its genesis contains a delicious irony:

> [ex]The PDC evolved from [a] program that was initiated in 2009 and funded by Sanofi Pasteur to facilitate the introduction of dengue vaccines into endemic countries. At its recent meeting in July 2013 … the … Steering Committee discussed and agreed to a new vision, mission and identity for the group, *changing its focus from vaccination to an integrated, holistic approach to dengue control*. [2013, emphasis added]

Just two years prior to that interview, Sanofi Pasteur's representatives had swaggered into the Cuba dengue conference lauding the imminent arrival of the ChimeriVax™ dengue vaccine. Now the company was returning to the partnership, funding PDC's renewed attempt to call attention to a threat that sprang from insects and viruses, infested environments and infected bodies.

PDC's continued advocacy is one reason why, in travel to a dengue-endemic country, one is still likely to witness a flurry of dengue-related advertisements, warnings, and announcements that frame the mosquito as the enemy (though such advertisements are less abundant in places like Puerto Rico's cruise ship ports). As vaccines move haltingly toward regulatory approval, their coming has to appear assured—but not so assured that "target" Third World governments and endemic communities give up on routine mosquito surveillance, which, though far from ideal as a preventive measure, remains the most time-tested way to keep the threat of dengue alive.

The renewed embrace of the mosquito approach on the part of dengue experts has also arisen because the Gates Foundation, as one vaccine developer explained to me in 2011, "is not totally convinced" that dengue is a serious health problem. He added that Gates Foundation leaders saw the disease as "neglected" not by science but by the governments and people whom it threatened most. Decision makers at Gates too began to doubt that dengue was a grave threat in the eyes of its victims and their governments. While the foundation's original 2003 commitment to DVI was $55 million, its renewal in 2011 amounted to just $6.9 million. The global health chimera—one part humanitarianism, one part capitalism, and one part biosecurity apparatus—thus remains vulnerable. In the absence of a major philanthropic supporter, the "need," the market, and the threat could disappear.

[h1]Conclusion

Humanitarianism, pharmaceutical capital, and biosecurity all operate chimerically: Each relies on hybrid technologies, speculative reasoning, and spectral thinking. As methods of regulation, both capital investment and biosecurity rely on speculation about a not-yet-complete future. They diverge, perhaps, in the kind of "life" to which they orient themselves. An effective

chimeric vaccine for dengue would ensure a minimal quality of life for poor or "developing" populations (or, as the Gates Foundation might put it, ensure that people in those populations could lead "healthy, *productive* lives"), even as it would reinforce the ability of tourists in the Caribbean or Southeast Asia to sustain a "good life" of leisure and relaxation, free from the threat of tropical fever. Likewise, global health's humanitarian head operates in partiality. Not every life can be saved (Fassin 2009; Redfield 2013). An examination of how these three, taken together, overlap, disrupt, or serve one another amid "cosmopolitical events" shows how the terrains of a global health as well as of a global economy and a global environment are mapped by chimeric reasoning (Anderson 2014; Stengers 2005b; Tsing 2005).

This is not to imply that anthropologists should be dismissive of problems and projects that carry the label "global." Critical attention to the chimera, as both ephemeral, anticipatory moment and material technoscientific form, can chart the articulation of the global. A view of the global as chimeric can turn analysis from a search for "transparent" relations between knowledge communities to what Sheila Jasanoff, writing about the seeming incompatibility of global climate science with local experiences, calls "conversational" relations that occur around "points of disjuncture" (2010:245). Studies of chimeric globalism can provide a mechanism for considering the uncomfortable proximity of hope with inequality, of accumulation of capital with the democratization of knowledge. As Choy notes, "articulation's power" lies in its ability to "[enact] the copresence of particular and universal interest" (2011:95). Anthropologies of global problems—particularly those of the global economy, global climate, and global health—tend increasingly to be predicated on both a scholarly interest in their origins and a political–ethical stake in their outcomes. It thus seems prudent to consider the potential for anthropology to participate in chimeric globalism. The purpose of such participation would not be to imagine a

clean break from the colonial, capitalist, and racist forces that constitute the global's troubled origins but to join those who would, with a tempered optimism, dwell anxiously in the imagination of a future-otherwise.

This participation places anthropologists among the scientists named in this article's opening question: How does the coming of novel technoscientific tools turn scientists into subjects of global health? Chimeric viruses clearly have potential economic value that nonchimeric ones do not, yet in global projects like DVI, economic value must be linked to noneconomic (moral–ethical) value. Sill, the advent of the chimera does not create a wholly new moral landscape. Instead, the chimera invites scientists of all kinds to think about how, in the past, they related to the nonchimeric version and how, in the future, they might address the chimeric version. The scientists at the CDC, in Nicaragua, and in Cuba routed their concerns about capital undermining intra-agency cooperation or international solidarity through their (partial) understanding of ChimeriVax™ and its material effects: its hybrid construction, its interaction with the immune system, and its long-term viability as a prophylaxis.

Chimeric globalism does not have to serve only the philanthrocapitalists. It can enable us to "slow down," as the CDC and Nicaraguan scientists did: to ask both what is not new about diseases like dengue and what ethical opportunities novelty might present. Such a view recovers the materiality of the monster, freeing it from simply being a heuristic device for understanding the slow takeover of public science by private capital. It also saddles anthropological analysis with partial responsibility for the creation of global health, not just as a discursive framework for understanding technoscientific, economic, and humanitarian practice but as a set of material arrangements that links bodies and knowledge. In this article, I have used the chimera—an intimidating monster, an ephemeral specter, a laboratory creation—to contemplate the

intersection of capital, humanitarian, and biosecurity interests that constitute, but never give finality to, global health. As monsters, as tools, and as figurations of the possible, chimeras force the biosocial issue: Rather than closing problems or forestalling concerns, they may, in their speculative partiality, open them up.

[h1]Notes

Acknowledgments. The research for and writing of this article were supported by a National Science Foundation Doctoral Dissertation Improvement Grant, the University of Wisconsin Graduate Student Collaborative, the Franklin & Marshall College Office of College Grants, and a Fernand Braudel Fellowship from Maison des Sciences de l'Homme. I presented earlier versions of this article on the panels "Mapping the Spaces and Subjects of Global Health" at the 2011 Annual Meeting of the Society for Social Studies of Science and "Social Animals and Us" at the 2014 Association for Social Anthropology Annual Meeting. I thank the panel organizers, Rebecca Marsland, Jeremy Greene, and Manjari Mahajan, along with Matei Candea, Andrew Lakoff, Ramah McKay, and Theresa MacPhail, for their supportive comments. I presented a later version in 2014 at the University of California, Davis, Science and Technology Studies Program colloquium, where Joe Dumit, Colin Milburn, and the faculty and graduate students who attended gave insightful commentary. I received further help from Jason de León, Jatin Dua, Sarah Besky, and Geoffrey Hughes when I presented the paper at the Socio-Cultural Workshop in the Department of Anthropology at the University of Michigan. Special thanks to the staff of the Nicaraguan Ministry of Health's National Diagnostic and Reference Center, the Centers for Disease Control and Prevention Dengue Branch, and the organizers of the 2009 and 2011 Dengue Courses at the Instituto Pedro Kourí in Havana, Cuba, for their cooperation with this

research. Finally, thanks to Angelique Haugerud and three anonymous reviewers from *American Ethnologist* for their help in improving the manuscript. Any errors, of course, are my own.

1. ChimeriVax™ was originally developed by the British firm Acambis, which was acquired by Sanofi Pasteur's parent company, Sanofi Aventis, in 2008. This technology has been applied to other flaviviruses transmitted by mosquitoes. ChimeriVax™ vaccines against Japanese encephalitis and West Nile viruses have also been produced. Here, I use the term as a shorthand for Sanofi Pasteur's dengue vaccine.

2. I refer to mosquito control based on pesticide-driven environmental management, that is, the elimination of mosquito breeding sites and the killing of adult mosquitoes with insecticides (see Nading 2014a). Around 2009–11, advances were also being made in the development of genetically modified mosquitoes designed to suppress vector populations (Nading 2014b). In 2009, this solution seemed to my informants less likely to succeed than the vaccine solution.

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